oven-controlled temperature stability

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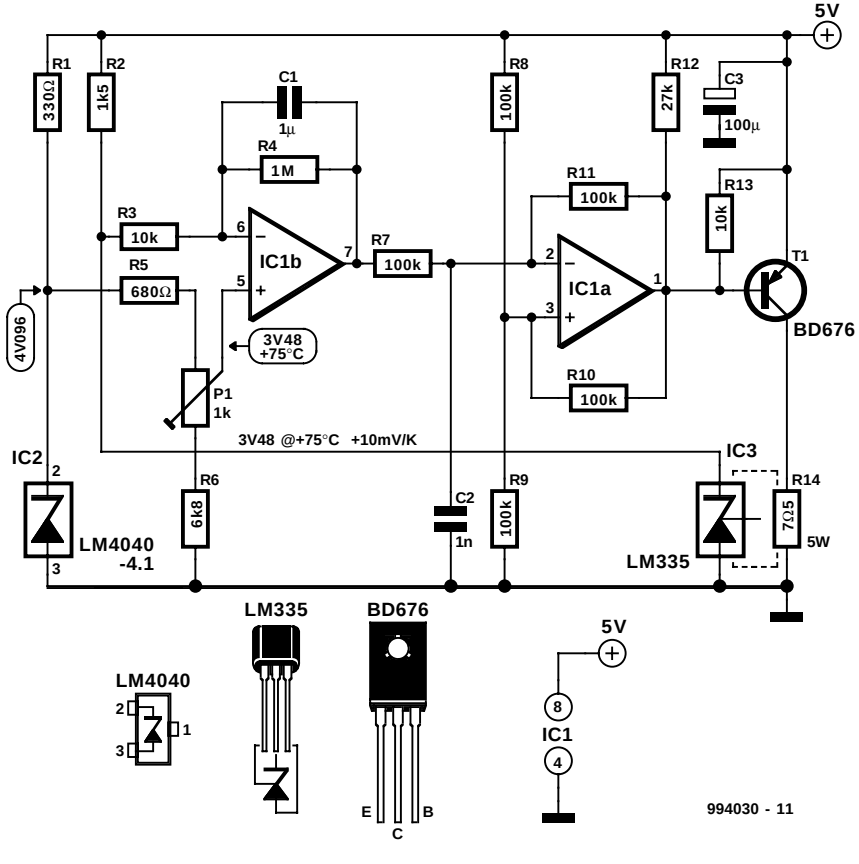
Accurate measurements that are not affected by ambient temperature may be taken when the part or circuit being tested is placed in an oven whose inside temperature is held constant after a short warming-up period. This works very well, indeed, when the tem-

perature inside the oven is held higher than the maximum ambient temperature. This is because the inside of the oven may be heated but cannot be cooled. This type of control is frequently used to stabilize a crystal oscillator or a surface acoustic wave (SAW) filter.

The circuit consists of a heating element, R_{14}, which is thermally coupled to temperature sensor IC_3. The output of the sensor at 75 °C is +3.48 V, which rises linearly at a rate of 10 mV °C^{-1}.

Integrated circuit IC_1 comprises an operational amplifier (at pins 5, 6 and 7) and a comparator (at pins 1, 2 and 3). The op amp is arranged as a ×100 amplifier and delivers an error voltage that depends on the difference between the actual temperature and that set with P_1. The preset can set the wanted temperature between +55 °C and +105 °C. The stable voltage across potential divider R_5-P_1-R_6 is 4.096 V, which is provided by reference voltage source IC_2.



The error voltage across R_7 is applied to the oscillator which is based on the comparator in IC_1. It alters the duty factor of the oscillator output in such a way that when the temperature drops, transistor T_1, and thus heating element R_{14}, remains on a little longer than when the temperature is stable.

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